Reg. No. : | | | | | | | | | | | |

R 3176

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Sixth Semester

(Regulation 2004)

Civil Engineering

CE 1354 — DESIGN OF R.C. ELEMENTS

(Common to BE (Part-Time) Fifth Semester Regulation 2005)

Time : Three hours Maximum : 100 marks

Instructions :

(1) Answer ALL questions

(2) Use of IS 456-2000 and Design aids (SP 16) are permitted

(3) Adopt Limit State Design unless otherwise stated

(4) Use M20 grade concrete and Fe 415 grade steel unless otherwise stated

(5) Missing data if any may be suitably assumed.

PART A — (10 × 2 = 20 marks)

1. Write down the value of partial safety factor for (a) concrete (b) steel.

2. Draw the stress-strain curve for concrete in the Limit state design for flexure.

3. Determine the maximum depth of neutral axis for a balanced rectangular section of overall depth 560 mm. Assume an effective cover of 40 mm.

4. What are the codal provisions for minimum reinforcement to be provided as main and secondary reinforcement in slab and their maximum spacing?

5. What are the types of reinforcements used to resist shear and write down the expression for shear resistance offered by each type.

6. Compute the development length of 28 mm diameter steel rods in tension zone.

7. According to I.S code "All columns should be designed for minimum eccentricity" — Justify the statement.

8. Draw a typical column interaction diagram showing the salient points.

9. What are the governing factors to decide the depth of R.C. footing?

10. Sketch one way and two way shears on footing.

PART B — (5 × 16 = 80 marks)

11. (a) A beam of rectangular section of width 225 mm and effective depth 500 mm is simply supported over a span of 5 m is reinforced with four numbers of 20 mm diameter mild steel bars in the tension side. Determine the position of neutral axis and the stresses in the topmost compression fibre of concrete and tension steel, if the beam carries a UDL of 9 kN/m (including self weight) for the entire span. Use working stress method of design.

Or

(b) (i) Explain two major limit states. (6)

(ii) Define characteristic strength and design strength of material. (4)

(iii) What are the assumptions in limit state design for flexure? (6)

12. (a) Calculate the amount of reinforcement required in a beam of rectangular section of width 300 mm and effective depth 500 mm to resist a factored moment of 300 kN-m.

Or

(b) Design a simply supported R.C. slab for a roof of a hall 4m x 4m (inside dimensions) with 230 mm walls all around. Assume a live load of 4 kN/m^2 and finish 1 kN/m^2. Use M 25 grade concrete.

13. (a) A beam of rectangular section of 350 mm width and 550 mm effective depth is reinforced with 6 numbers of 20 mm diameter bars out of which three bars have been bent up at 45° Determine shear resistance the bent up bars and the additional shear reinforcement required if it is subjected to an ultimate shear force of 300 kN.

Or

(b) A beam of rectangular section of width 300 mm and effective depth 550 mm is subjected to an ultimate moment of 15 kN-m, ultimate shear force of 50 kN and ultimate twisting moment of 15 kN-m. Design the reinforcement.

14. (a) Design an axially loaded tied column 400 mm × 400 mm pinned at both ends with an unsupported length of 3 m to carry a factored load of 2300 kN.

Or

(b) Design an uniaxially eccentrically loaded braced rectangular column for the following data :

Ultimate axial load = 1200 kN.

Ultimate moment in long direction = 280 kN-m.

Unsupported length of column = 3.4 m.

Effective length in the long direction = 3.2 m.

Effective length in the short direction = 2.8 m.

Column section = 360 mm × 540 mm

15. (a) Design a footing for 250 mm thick masonry wall which supports a load of 200 kN/m at service state for the following data :

Safe bearing capacity of soil = 150 kN/m^2

Angle of repose of soil = 30°.

Unit weight of soil = 20 kN/m^3.

Or

(b) A solid footing has to transfer a dead load of 900 kN and an imposed load of 500 kN for a square column of size 400 mm. Assume the safe bearing capacity of soil as 200 kN/m^2. Design a square footing to support the above column.